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AUTHOR Herron, James W.
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ABSTRACT

The aquatic weeds discussed in this manual include algae, floating weeds, emersed weeds, and submerged weeds. Specific requirements for pesticide application are given for static water, limited flow, and moving water situations. Secondary effects of improper application rates and faulty application are described. Finally, techniques of limited area application are given. (BB)

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Applicator Training Manual for:

AQUATIC WEED CONTROL

James W. Herron, Extension Agronomy Specialist

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AQUATIC WEEDS

There are several distinct differences in growth habits among aquatic weeds. As a result, aquatic weeds may be divided into four groups, with certain similarities within each group.

Algae

There are several forms of algae, including filamentous algae (example, *Pithophora sp.*) and the so-called "branched algae," which includes musk grass (*Chara sp.*).

Floating Weeds

Floating weeds are seed-bearing plants which float free on the water's surface, never becoming rooted in the soil, and are propagated by sexual and asexual means.

Emersed Weeds

Emersed weeds are always rooted in the soil, with some leaves and flowers emergent above the water surface. The leaf form may differ for the plant portions which are above and below the water. These plants are seed-bearing, persistent and somewhat difficult to control.

Submersed Weeds

Submersed weeds are rooted in the soil, as are emersed weeds, but the whole plant is covered by water. However, the flowering portion of the plant may emerge above the water surface.

SPECIFIC REQUIREMENTS

Specific requirements for commercial applicators in the aquatic pest control category relate generally to a practical knowledge in three areas. These areas may be defined as water use situations, the secondary effects of pesticides upon organisms in the aquatic environment, and the principles of limited area application.

Water Use Situations

Habitats for aquatic weeds involve various proportions of water and soil, ranging from intermittently wet ditches to ditches which always hold standing water, to streams, stock ponds, farm ponds, lakes, and to intermediate habitats. For purposes of this discussion, however, we can confine our attention to three types of water use situations.

Static Water:

Static water can be defined as water confined for considerable periods of the year, or totally confined within a known area with no movement of water to downstream locations. If a herbicide is applied for weed control, there is no reason to expect that any appreciable downstream effect may

occur, except overflow resulting from unusual storm conditions. Water impoundments such as stock ponds, and in some cases farm ponds, will fit into this category.

Limited-flow Water Impoundments

This type refers primarily to farm ponds, lakes, and ditches. Ditches may be intermittently wet and dry, depending upon local climatic conditions. However, herbicides applied to habitats such as ditches may present some hazard to downstream locations, due to movement of the applied pesticide following an influx of water from surrounding areas. The purpose of the ditch is to drain the surrounding land area so considerable amounts of water must pass through the ditch area. In addition, many farm ponds may be characterized as having limited flow since there nearly always is an overflow pipe and an emergency overflow channel (spillway). The overflow pipe is designed to permit passage of a continuous and relatively well-defined amount of water at all periods of the year. The emergency spillway is provided to permit outflow of water from the pond at periods of the year when storm incidence may cause excess amounts of water to accumulate in the pond. In such cases, pesticide applications to limited-flow water areas may be found in small amounts in waters downstream from the application site. It is conceivable that larger amounts of pesticides from a treated area may be found downstream in the event of sudden rain storms, which interrupt or come immediately after pesticide application.

Moving Water

Moving water is characterized as water found in small streams, creeks, streams, and rivers where there is always some detectable movement. Applied pesticides may be found in downstream locations in varying amounts away from the area of original application. Such situations present the greatest potential for concern as an environmental hazard.

Secondary Effects of Pesticide Applications

Improper Application Rates:

Proper application of herbicides to aquatic situations involves equipment calibration and calculation of appropriate water volumes in order to determine correct dosage rates. There are several well known and proven methods of equipment calibration and water volume calculation to determine pesticide application rates. Environmental hazard can result from the improper application rate.

Static Water

If application rates are too low in a static water situation, desired kill of pests may not be accomplished. However, the water supply may be contaminated and unsuitable for use by livestock or as an irrigation supply. In the event of excessive application rates, damage to the fish populations may result, either from direct toxicity or an excessively rapid kill of plant materials which may result in oxygen depletion in the water, leading to suffocation of the fish population. Excessive application rates might also exclude livestock from use of the water for a period of time, and would rule out the use of water supplies for irrigation for an indefinite period of time. However, little effect would probably be observed as far as downstream hazards are concerned, since little or no outflow normally occurs.

Limited-flow Water

Improper application rates could result in contamination of downstream water used by municipalities or communities for domestic water supplies. The hazardous condition would exist whether limited-flow water sources were treated with an application rate too low to accomplish a desired kill of vegetation or if the rate were excessive. It is conceivable that excessive rates might result in a too rapid rate of kill of vegetation which could lead to oxygen depletion and subsequent suffocation of the fish population. This might further complicate contamination of downstream water supplies utilized as domestic waters, due to bacterial contamination resulting from decay and decomposition of killed fish.

Moving Water

Application of pesticides to moving waters may lead to at least temporary contamination of downstream water supplies which may be utilized for domestic consumption. In addition, the pesticide, though applied locally for pest control, is certain to move to other areas of the stream and affect various aquatic organisms.

Faulty Application:

There are two major hazards involved in faulty application of pesticides: (1) possible contact of applied pesticide with non-target organisms with resultant damage: (2) failure to apply the pesticide to the target pest, resulting in no kill of the desired pest. For example, it would be hopeless to apply granular herbicides in fast moving water, whereas they might work quite well in static water impoundments and even in limited-flow water situations.

All currently registered herbicides employed for aquatic weed control are rated as limited, or not at all toxic to fish, birds, insects, and other aquatic organisms so long as proper application rates and techniques are employed. Other pesticide labels should be carefully observed to ensure that the aquatic environment is not unduly contaminated as a result of pest control efforts.

Limited Area Application

Aquatic weeds may occur in the whole body of water as submersed weeds, or may appear to cover the whole surface of the water as floating weeds. Conversely, the same weeds or other pests may occur only in limited areas within a body of water, whether it is a static, limited-flow, or moving body of water. "Limited area application" implies the advantage of improved safety to aquatic species, specifically the fish population. If pesticides that are potentially toxic to the fish population are applied to a limited area, the fish population can move to untreated water areas and escape potential toxic effects. Also implied in this concept is that a minimal amount of pesticide is applied, which tends to reduce the potential effect upon downstream environments in the event of spillover from the treated body of water.

Surface-applied Treatments:

Contact pesticides are generally applied to control floating weeds. Usually only one-fourth to one-third of the surface area of the body of water is treated at a time to reduce the possible hazard of oxygen depletion resulting from too rapid kill of large masses of vegetation in the water, which may affect the fish population.

To determine the number of gallons of water in a pond or small lake, the following method may be used. First, determine the surface area. If the pond is circular, measure the radius in feet, square that figure and multiply by 3.1416; if the pond is rectangular, multiply the length by the breadth, in feet. Multiply the surface area by the average depth of water and finally, multiply this figure by 7-1/2.

Total Water Column Treatments:

In this application technique, frequently employed with emersed weeds and often employed with algae treatments, the whole body of water (including the water column from the bottom of the water impoundment to the surface) is treated. The entire volume of the body of water is calculated and the chemical is added to reach a specified dilution in the total water column. An alternative is to calculate the entire water body and then treat only one-fourth or one-third of the total water column, based on surface area, confining the treatment to selected sections of the pond where the pest infestation may be more intense. Specific application techniques include injection directly into the water of the undiluted chemical, or arranging for some dilution of the chemical to be sprayed or cast upon the surface of the water. With either method, further dispersal throughout the water column is dependent upon water currents. Aquatic granules are formulated to provide rapid sink to soil-water interfaces to control emersed and submersed weeds.

Bottom Acre-foot Treatments:

This is a specialized application technique which is intended primarily for control of submersed aquatic vegetation. A boat carrying application equipment drags a hose or boom over and just above the lake or pond bottom. The chemical is dispersed through nozzles and the specific gravity of the chemical causes the treatment to remain near the bottom and in the proximity of the rooted, submersed weeds. Fish can move out of this water level and avoid any direct contact with the chemical until chemical residues are diluted or dissipated.

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